

REMARKS

Dependent claims 7 and 13 have been amended to remove the recitation of cones or frusta cones, which features are now included in new dependent claims 15 and 16.

The invention, as claimed in independent claim 1, relates to a light-emitting diode including a substrate, a light-generating layer on the substrate, a transparent current-spreading layer on the light-generating layer, a first electrical contact layer on the back of the substrate, and a second electrical contact layer on the current-spreading layer. The top surface of the current-spreading layer has vertical structuring (e.g., prisms, pyramids, cones, etc.) to improve the decoupling of light, and the second electrical contact layer has a lateral structure (e.g., structures 51-54 shown in Figs. 2-4) that substantially uniformly couples electrical current into the current-spreading layer. Independent claim 14 includes all of the features of claim 1 and in addition recites that the second electrical contact layer has a lateral structure with a circumferential contact web arranged about a central contact structure.

Independent claims 1 and 14 stand rejected under 35 USC 103(a) on the basis of Krames in view of Nozaki.

Krames is cited for disclosure of an LED with a substrate, a light-generating layer, a transparent epitaxial (said to be current spreading) layer, first and second electrical contact layers, and vertical structuring to decouple light. Krames does not disclose that the second electrical contact provides substantially uniform coupling of the current into the current spreading layer, and that the second contact layer has a circumferential contact web structure,

Nozaki is cited for disclosure of a transparent current spreading layer 6, and an upper electrode 20 with a lateral structure by means of which uniform current injection can be achieved.

In the office action, it is stated that it would be obvious to modify the LED of Krames to incorporate a current spreading layer (i.e., 6 in Nozaki) with an upper electrode (i.e., 20 in Nozaki) with a lateral structure as taught by Nozaki

Applicants submit, however, that one of ordinary skill in the art would not consider modifying the LED-structure of Krames to include Nozaki's current spreading layer and upper electrode for a number of reasons.

First, such a modification of Krames in view of Nozaki would not result in a device having the structure recited in claim 1. According to claim 1, the second electrode is disposed on the current spreading layer. A second electrode 4 is shown disposed on the epitaxial layer 1 in Krames, but the electrode 20 is not disposed on the current spreading layer 6 in Nozaki. Instead, upper electrode 20 is disposed on contact layer 7, which is in turn disposed on current spreading layer 6. The upper electrode (20) thus is not disposed on the current spreading layer (6) as required by claims 1 and 14. If a person skilled in the art were to modify Krames in view of Nozaki, he or she would accordingly incorporate a current spreading layer (6), a contact layer (7) and a second electrical contact (20) in the Krames LED. Nozaki points out that the contact layer (7) and a sintering process for the electrode (20) on the contact layer (7) is important for achieving an ohmic characteristic. Therefore a person skilled in the art would not omit the contact layer (7) between the current spreading layer (6) and the electrical contact (20) in order to optimize the coupling of the current into the current spreading layer.

Second, the present invention is based on the combination of surface structuring of the current spreading layer and an improved current spreading layer having a lateral structured second electrical contact layer for uniform current injection (page 4, lines 3-6 of the specification and claims 1 and 14). An additional contact layer would complicate the manufacturing since it requires an additional deposition step and has to be removed afterward in order to structure the surface of the current spreading layer. According to the present invention a uniform coupling of the electrical current into the current spreading layer is accomplished by the lateral structure of the second electrical contact layer. Therefore an additional contact layer, as taught by Nozaki, is outside of the scope of claim 1.

Accordingly the subject matter of independent claims 1 and 14 would not be obvious from Krames in view of Nozaki, and claims 1 and 14 are allowable under 35 USC 103(a). Claims 2-13 and 15-16 depend on claim 1 and are allowable with it.

In addition, dependent claims 7 and 13 (which had covered either pyramids or cones) had been rejected the disclosure of cones in Nozaki, which does not disclose pyramids. Claims 7 and 13 are now limited to pyramids, which are nowhere described in or suggested by the cited references, and this provides an additional reason for allowance of claims 7 and 13.

Independent claim 1 also stands rejected under 35 USC 103(a) on the basis of Nozaki in view of Krames. Modifying Nozaki in view of Krames also would not result in a device according to claim 1.

As outlined above, Nozaki discloses a LED having a current spreading layer (6), an electrode (20) and a contact layer (7) positioned between the electrode and the contact layer. A modification of this LED by a structuring of the current spreading layer, as suggested by Krames, means that the uncovered semiconductor surface will be structured in order to improve the extraction of the generated light. However, this would not alter the layer sequence of the contact with a contact layer (7) arranged between the current spreading layer (6) and the electrode (20) as is required by Nozaki. Accordingly a modification of the LED of Nozaki in view of Krames would not lead to the subject matter of claim 1 having a second electrical contact layer disposed on the current spreading layer.

Independent claims 1 and 14 also stand rejected under 35 USC 103(a) on the basis of Nishitani (JP 07-162037) in view of Nozaki.

With respect to claims 1 and 14, Nishitani discloses the same features as Krames. Both, Nishitani and Krames fail to disclose that the second electrical contact provides substantially uniform coupling of the current in the current spreading layer, and that the contact layer has a circumferential contact web structure. The arguments outlined above with respect to the combination of Krames and Nozaki therefore equally apply to the combination of Nishitani and Nozaki. Since a combination of Krames and Nozaki would not result in a device with all features of claim 1, also a combination of Nishitani and Nozaki would not result in such a device. If a person skilled in the art would modify the LED, as taught by Nishitani, according to Nozaki, he would again design a LED having an electrode that is not deposited on the current spreading layer, but on an additional contact layer.

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All claims are submitted to be in condition for allowance, and such allowance is respectfully solicited.

Enclosed is a \$110 for the Petition for Extension of Time fee. Please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,

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